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Patent

REMARKS

It is our understanding that claims 1-20 remain pending in this application. Claim 16 has been amended for reasons specifically remarked upon, below.

Objections to the claims:

Claim 16 was objected to because of an informality. Responsive to the Examiner's guidance, claim 16 has been amended to correct its dependence. No new subject matter is added by this amendment.

§ 103(a) rejections of the claims:

Claims 1-20 are rejected as being unpatentable (obvious) over Lau in view of Thiel. Respectfully this is error.

Regarding claims 1, 12, and 17, the Action states:

Lau (Fig. 6 and 7) discloses a measuring apparatus and corresponding method comprising laser 27 as a light source, and an optical channel including an interferometer 124, a target mirror 120, a beam splitter 126, a detector 128 for detecting a first portion generated by the beam splitter, with the interferometer receiving a second portion from the beam splitter that is combined with a reference beam generated in the beam splitter, and a fringe counter 48 as a receiver for the combined beam from the interferometer.

We agree, but urge that patentability is effected here by what this omits. Lau further teaches a "tracking mirror 28 ... under servo control [by] the x-axis output [and the Y-axis output] of the photodiode 128." And as the Action next correctly states, "*Lau, however, only discloses a single channel in the device.*"

Continuing, the Action states, "*Thiel (Fig. 1) discloses a measuring apparatus and corresponding method with a pair of optical channels 3 and 4 that allows for measurement of two locations on the test object.*" Again, we agree, but urge that this and Lau is not determinative of patentability of the claimed invention.

As has long been established:

To establish a prima facie case of obviousness, three basic criteria must be met. First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings. Second, there must be a reasonable expectation of success. Finally, the prior art reference

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(or references when combined) must teach or suggest all the claim limitations.
MPEP §2142

Applying this to the combination of Lau and Thiel, we respectfully submit that the *prima facie* case for obviousness has not been met because the present rejection fails to meet all three of the criteria.

In an apparent effort to address “*suggestion or motivation*” for the combination the Action states “*... it would have been obvious ... to add a second, identical channel to the device of Lau as per Thiel, as the second identical channel would allow for multiple measurements of multiple locations of the target object.*” However, this is merely unsupported conjecture. It cites no support “*in the references themselves*” and it does not state that such is “*in the knowledge generally available to one of ordinary skill in the art*” (e.g., it does not take official notice). Furthermore, even this conjecture is wrong because the claimed invention does not merely “*allow for multiple measurements of multiple locations of the target object.*” The present application is titled “*Rotation And Translation Measurement*” because the present invention measures with respect to each of the x, y, and z linear axes and as well as with respect to at least two of the rotational axes for pitch, yaw, and roll. In sum, this is at least 5-axis measurement. See e.g., pg. 15, ln 10 through pg. 16, ln. 2 as regards embodiments such as those recited in claims 1, 12, and 17, and see pg. 2, ln. 13 through pg. 3, ln 10 as regards the problems being solved and how the prior art (including Thiel) has failed to solve those problems.

Turning now to the second criteria, we submit that there would not be a reasonable expectation of success if Lau and Thiel were combined in an attempt to form the claimed invention. Lau performs three and five axis measurement, but specifically states that its embodiment in FIG. 6-7 is “*only to measure ... position in the XYZ coordinate system*” (i.e., 3-axis measurement). Further, it is only capable of absolute position measurement based on an initial absolute distance calibration between its tracking mirror and its target (col. 4, ln. 4-9). Furthermore, it uses a fixed frequency laser (see e.g., col. 4, ln. 15-24), and thus its beam is unmodulated. In contrast, Thiel performs distance measurement (i.e., 1-axis measurement, specifically X-axis measurement with respect to its figures). Further, Thiel performs absolute distance measurement by use of a tunable laser (col. 5, ln. 41-46) and special beam modulation. Furthermore, Thiel requires that its two interferometers used for this be separated by a known fixed distance (L_{Ref})(col. 5, ln. 46-51). Thus, Lau’s XYZ axis system could not be combined with Thiel’s X-axis system to arrive at Applicant’s 5-axis measurement invention (XYZ + at least

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two of roll, pitch, and yaw). Additionally, Lau's servo controlled tracking mirror could not be reconciled with Thiel; Lau's tracking mirror to target initial distance requirement cannot be reconciled with Thiel; Thiel's fixed known interferometer separation requirement cannot be reconciled with Lau; and none of these are aspects of the claimed invention. Lau's fixed frequency laser approach and Thiel's tunable laser needs also cannot be reconciled, and neither can Lau's unmodulated and Thiel's need for specially modulated light beams.

Finally, turning to the third criteria necessary to support a rejection on the basis of obviousness, the combination of Lau and Thiel does not teach or suggest all the claim limitations. The Action mischaracterizes Thiel as having two channels. Thiel only works by virtue of having two sets of interferometers that have fixed known separation, and thus is more correctly regarded as being a single channel. Thiel also does have any element(s) equivalent to Applicant's beam splitters or the detectors that sense the first portions these split out from the measurement beam. And the interferometers that Thiel does have are not equivalent to Applicant's, because they do not receive second portions that beam splitters split out from the measurement beam.

In summary, the Action has failed to state a maintainable *prima facie* case for an obviousness-based rejection of any of the independent claims in this case. We therefore respectfully submit that all of claims 1, 12, and 17 are allowable, and that it follows from this that the dependent claims, and thus all claims in this case, are also allowable.

Regarding claims 11, 16, and 19-20, the Action states "*the light source of Thiel is tunable, and therefore able to be modulated to produce a light beam with a modulation characteristic.*" This statement is wrong. As is well known in the art, tuning and modulation are not the same. A light beam may be tuned with respect to its wavelength and yet have no modulation, and a light beam may be modulated yet not be tuned with respect to a desired wavelength.

However, apparently overlooked in the Action, Thiel employs modulation, albeit of a special type that cannot be reconciled with the phase sensitive detection of the claimed invention. In Applicant's specification phase sensitive detection is illustrated with FIG. 4-5 and discussed at pg. 8, ln. 16-27 and particularly pg. 9, ln 15 through pg. 10, ln 31.

The Action continues:

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Additionally, although the computer of Lau fails to explicitly disclose a phase sensitive detection, or a demodulator for demodulating a modulated signal, it would have been obvious to one of ordinary skill to make detection phase sensitive, as Official Notice is taken as to making demodulated measurements of a modulated signal and phase related measurements in interferometry.

With respect to the taking of Official Notice, it is unclear from the Action what a “demodulated measurement” is in the present context. Accordingly, since the technical line of reasoning underlying this is not clear and unmistakable (MPEP 2144.03(B)), we respectfully challenge the Office to support this finding with adequate evidence (MPEP 2144.03(C)). With respect to the fact that there are “phase related measurements in interferometry,” we except this but urge that it is irrelevant to phase sensitive detection as it relates to the claimed invention. As can be appreciated from review of the portions of Applicant’s specification noted above, phase sensitive detection is used for electrical signal processing by the invention that is coincidental to the underlying optical phase interference between two light beams also being used by the invention.

Finally, with respect to these and any future takings of Official Notice, we note that such still need to be combined with the references to support rejection. The Action here again fails to state a prima facie case for obviousness. None of the criteria of suggestion or motivation for combination, reasonable expectation of success, or teaching or suggestion of all the claim limitations has been argued.

CONCLUSION

Applicant has endeavored to put this case into complete condition for allowance. It is thought that the objections have all been corrected by amendment and that the §103 rejections have been completely rebutted. Applicant therefore asks that all objections and rejections now be withdrawn and that allowance of all claims presently in the case be granted.

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Respectfully Submitted,



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